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ABSTRACT

A study examined children's memory of stories under three varying conditions and focused on how different interaction styles and children's innate abilities affect literacy development. The three conditions tested closely mirrored the three story-reading styles evidenced by teachers of young children were: (1) a control condition where there was no planned interaction between teacher and child beyond the adult reading the story to the child; (2) a questioning condition where the story was interrupted and the child was asked questions regarding the story content by the adult; and (3) a co-construct condition where the child and the adult interacted freely over the text. Subjects were 24 kindergarten students (15 female, 9 male) from a Chicago Public School. Results indicated that the average and above average groups required less prompting than did the low memory ability group. Children with above average memory ability used significantly more words per sentence than did children with average and below average memory abilities. Findings suggest that, overall, significantly more inferences were drawn in response to comprehension questions under the co-construction condition than under the questioning or control conditions. Additionally, significantly fewer incorrect responses were given when the children were under the co-construction condition than when they were under either the questioning or the control conditions. (Contains 10 tables of data and 20 references.) (CR)

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Individual Difference in the Social Construction of Knowledge with Young Children Over a Storybook Reading

Introduction

Advice to "read aloud to children as often as possible," is frequently given to both parents and teachers. According to the report from the Commission on Reading, *Becoming a Nation of Readers* (Anderson, Hiebert, Scott, & Wilkinson, 1985), "The single most important activity for building the knowledge required for eventual success in reading is reading aloud to children" (p.23). What is the knowledge required for successful reading and how does reading aloud to children facilitate that knowledge?

Recently, researchers have begun to use a sociohistorical frame of reference first articulated by Lev Vygotsky (1978, 1986) to guide their work. A Vygotskian approach treats learning through social guidance and motivation as central to an account of literacy development.

When adults read to children they often engage children in an ongoing dialogue related to the story (Brice-Heath, 1982; Ninio & Bruner, 1978). The dialogue surrounding a story reading can have important effects on literacy development. Through interpreting, modeling, and labeling during a story reading, the adult facilitates both language and concept development in the child. This interaction is thought to have a powerful effect on the coherent understanding that Trabasso and Magliano (1995) feel is essential to an integrated interpretation of a text.

Therefore, the role of the teacher or adult is central to the learning process. Through modeling appropriate strategies, clarifying when the child is confused, weaving pieces of information into existing concepts held by the child, and serving as a source of information, the teacher, or adult, can link young children to understandings they normally would not have.

Not only does the adult mediate a story reading by asking questions, prompting responses and keeping a child focused, but when interacting with an adult children are able to generate their own questions about the text, an activity which may enhance integration of text information with the child's own knowledge base and thereby facilitate comprehension and memory (Raphael & Gavelek, 1986; Holdaway, 1979).

If social interaction is a primary variable in the development of children's literacy, it must be understood that what is taught is functionally contingent. That is, the conversational interaction between adult and child will depend upon the child's need to know and readiness to respond. Many types of adult-child interactions could have a positive effect on a child's comprehension and memory.

Almost every literacy event is co-constructed to some extent, however, we do not yet fully understand what kinds of social interactions foster individual children's development toward independent functioning. Paris, Newman and Jacobs (1985) charge that "memory researchers could investigate remembering with varying degrees of social support but rarely do."

Asking children to retell stories that they have heard or read or to recall information in general, is an important way that teachers and researchers access children's understanding of events. Additionally, the ability to retell a story or to answer comprehension questions appropriately is significant to how we think about academic success. This being the case, it is crucial that we understand how this ability develops and the types of instruction/interactions which facilitate development for different children. The current research investigates children's comprehension and memory of stories under 3 varying conditions and focuses on how different interaction styles and children's innate abilities affect literacy development.

RESEARCH DESIGN

Three conditions (varying degrees of interaction) closely mirroring the three story-reading styles evidenced by teachers of young children (Dickinson, 1994) were tested. The three conditions were: (1) a control condition in which the child had no direct interactions with the adult reader beyond hearing the story read by the adult; (2) a questioning condition in which the story is interrupted and the child is asked questions regarding the story content by the adult; and (3) a co-construction condition in which the child and the adult interacted freely over the book.

In order to build rapport and to ensure that all the children had some experience listening, responding to, and hearing the responses of others to high quality children's literature, the experimenter became the "story lady" for seven weeks prior to the beginning of data collection. During each story reading session, the children were given time to ask questions or to make comments about the stories they had just heard.

Subjects- Twenty-four children (15 female, 9 male) from a Chicago Public School kindergarten class participated in the study. Their mean chronological age was 5.8 months with a range of 5.4 to 6.3. Four of the children, (17 percent) were classified as bilingual, that is, their parents identified a language other than English as the language spoken in the home when they registered them for school. No handicapping conditions were identified for any of the children. Thirty-eight percent of the students were low income, defined in Chicago Public Schools as any child qualifying for the federally subsidized school lunch program. The class was racially diverse, 37.5 percent African American, 29 percent white, 21 percent Hispanic and 12.5 percent Asian.

Materials- Three books by the Australian author Mem Fox (1983, 1985 & 1989) were chosen for the study. Wilfrid Gordon McDonald Partridge, (Fox, 1985) Night Noises, (Fox, 1989), and Possum Magic (Fox, 1983) were chosen for their interesting text, continuity of theme, the appeal of the illustrations, and the high degree of picture-text correspondence.

Design- The study employed a modified, Latin Square design with repeated measures. The order of treatments and order of stories were counterbalanced across children. Every child listened to each story and completed each of the two comprehension measures, retelling the story, and answering a series of comprehension questions.

General Procedures- Procedures were divided into four specific phases.

Phase 1. The children heard the text read by the adult experimenter with the book illustrations available to the child. Only very minimal and unplanned interactions between the adult and the child took place during this phase. If the child tried to initiate interactions with the experimenter during the story reading, they were discouraged with statements such as, "Let's listen to the story now" or "We'll have time to talk after we've finished, but you need to be quiet and listen now."

Phase 2. The experimenter reread the book but varied the interaction with the child in one of three ways. Across the children, the order in which books were read was counter-balanced by condition. The three conditions were:

- **Co-construction-** When engaged in this condition the child and the experimenter interacted together freely over the text and its illustrations as the story was read for the second time. Either the child or the experimenter could bring up topics for discussion, introduce questions, or point out interesting details at any time during the reading.
- **Questioning-** The experimenter followed a pre-constructed script of questions which the child answered as the text was read. A series of 15 questions was developed for each of the three stories.
- **Control Condition-** the story was reread to the child in phase 2 with no planned interaction between teacher and child taking place during the reading. If the child tried to initiate interactions in this condition, the experimenter used the same discouraging phrases as were used during phase one.

Phase 3. The child was instructed to retell the story as though he or she was telling it to a friend who had not previously heard it. The children were given time to recall the story on their own, spontaneously, but when hesitations became prolonged or the child requested help, prompts were provided.

If the child requested no help, and retold the story without hesitation, no prompting interventions were given. Prompting, when given, was varied but not systematic. All prompts were coded and were taken into account during the analyses. Spontaneously recalled clauses were coded as such.

Phase 4. After retelling the story, each child was asked to respond to a series of six summary comprehension questions. The summary questions were designed to collect the same kinds of information across stories.

Coding Procedures and Recall Measures- The extent to which the children extracted and retained information from the stories was assessed in two ways. First, the children are asked to retell the story to the teacher and to then answer a series of six summary comprehension questions. All phases of the interactions and post interactions were audio taped and later transcribed verbatim. The two measures were analyzed separately.

Each of the story texts and each of the children's 72 retelling protocols were parsed into clauses. After having parsed the stories and the children's retelling of the stories, the two sets of clauses were matched against each other using gist criteria. The number of clauses remembered for each condition were then used to obtain proportions using the total number of clauses contained in each story as the divisor. The number of text clauses that were remembered

spontaneously and those remembered after each type of prompt were then found for each child in each condition and the same procedure was used for determining proportions.

Phase two of the post-interaction coding scheme measured the child's performance on each of the six comprehension questions asked after the child had retold the story. The answers to these questions was coded as either right or wrong based on gist criteria.

A text explicit answer would be one in which the information in the answer could be explicitly attributed to the story text without benefit of the child's interpretation while an inferential answer would be one in which the child has either deduced an answer beyond that specifically given in the text or made an appropriate generalization. For example, if the adult experimenter asked, "Why do you think Grandma Poss had trouble remembering how to make Hush visible again?" and the child answered, "Because the magic spell wasn't in the book." that would be a text based answer. On the other hand, if the child answered, "Because Grandma Poss is old and old people forget things a lot." that would be an answer based on inference.

Results are analyzed in a series of Analysis of Variances (ANOVAs). We were interested in determining if the children's spontaneous and prompted memory for the text differed based on the condition under which they listened to the story and their ability to retell a story with only the minimal social support offered in the control condition. We were also interested in comparing number of prompts given in each of the three listening conditions and the effects of memory ability on the children's recall of the story text. Additionally, analyses of the number of words used per sentence and the ability to answer comprehension questions was done.

Findings

The reporting of the children's narrative recall is presented below and is divided into three sections. The first section is concerned with the effect of memory ability on the children's subsequent recall of the story text in each of the three conditions. Section two is concerned with the average number of words per sentence used by the children in their narrative recall. An analysis of the mean number of words per sentence as a function of the child's memory ability and condition was done. Finally, section three is concerned with the proportion of comprehension questions that were appropriately answered following the child's recall of the story text. A comparison of the types of answers provided by the child is also reported.

Memory for Story Text

Because of reliable individual differences among the children, an analysis of the influence of the child's ability to recall and the experiences during listening on the child's spontaneous memory for text across the three conditions was done. The children were divided into above average, average and below average ability groups on the basis of their total memory scores in the control condition.

Total Recall. In order to assess whether there was an ability by treatments interaction on total recall, the mean proportion of total clauses recalled as a function of condition and ability were compared in a Two-Way Analysis of Variance. Table 1 shows the means and standard deviations of total recall for the three ability groups in each condition. Table 1a displays an ANOVA summary for the comparison of those means.

Table 1

Mean Percentage of Clauses Recalled as a Function of Memory Ability and Condition

<u>Memory Ability</u>		<u>Control</u>	<u>Questioning</u>	<u>Co-Construction</u>	<u>Mean</u>
Above Average	Mean	36.69	34.54	27.49	32.91
	S.D.	[7.19]	[11.24]	[8.73]	
Average	Mean	23.93	23.40	26.70	24.68
	S.D.	[3.43]	[3.61]	[8.33]	
Below Average	Mean	14.20	19.68	20.30	18.06
	S.D.	[6.40]	[10.40]	[7.89]	
Mean		24.45	25.59	24.62	

Table 1a**Summary ANOVA for Table 1**

<u>Source</u>	<u>Df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Between Ss	21			
Ability	2	1235.02	11.23	< .01
Error (1)	19	109.95		
Within Ss	44			
Condition	2	7.21	0.19	< .84
Condition X Ability	4	132.99	3.41	< .02
Error (2)	38	38.97		

Analysis of Variance results summarized in Table 1a indicate that total memory scores differed significantly between the three groups ($P < .01$). The condition by interaction effect was also significant at ($P < .02$). Thus, the amount recalled in each condition was influenced by the child's ability as measured in the control condition.

The influence of the children's ability and the effects of listening experience on total recall are interesting. Children in the above average ability group recalled the most in the control condition which allowed them a relatively uninterrupted interaction with the author of the text. Children in the below average ability group appear to have done equally well in the questioning or co-construction conditions but less well in the control condition. Therefore, the below average ability children benefited from an intervention which guided them through the story-text. Children in the middle group did equally well in the questioning and control conditions and slightly better in the co-construction condition. Although co-construction appears to have a leveling influence on the memory ability of the children. The effects of individual difference have a powerful influence on this data set. Average and below average students were somewhat facilitated by an adult intervention while above average students were inhibited by the intervention.

Spontaneous Recall. The mean number of spontaneously recalled clauses for each treatment were then compared by the same method. Table 2 and 2a compare those means.

As with total amount of recall, the spontaneous recall differs significantly between the three groups ($P < .01$). The effects of condition were not significant. However, the condition by ability effect was significant at ($P < .02$). Students of below average memory ability are benefited by the two adult interventions while children of above average memory ability seem to be hampered in some way by the co-construction condition. Children of average memory ability on the other hand seemed to do equally well in all three conditions.

Table 2

**Mean Percentage of Spontaneously Recalled Clauses
as a Function of Memory Ability and Condition**

<u>Memory Ability</u>		<u>Control</u>	<u>Questioning</u>	<u>Co-Construction</u>	<u>Mean</u>
Above Average	Mean	33.81	33.59	25.19	30.86
	S.D.	[6.19]	[11.93]	[9.58]	
Average	Mean	21.87	20.01	21.03	20.97
	S.D.	[3.04]	[2.81]	[10.22]	
Below Average	Mean	7.86	17.21	16.86	13.98
	S.D.	[3.72]	[12.13]	[9.41]	
Mean		21.18	23.60	21.03	

Table 2a

Summary ANOVA for Table 2				
<u>Source</u>	<u>Df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Between Ss	21			
Ability	2	1601.77	14.25	< .01
Error (1)	19	122.40		
Within Ss	44			
Condition	2	45.79	.88	< .42
Condition X Ability	4	174.91	3.37	< .02
Error (2)	38	51.93		

Average Number of Words Per Sentence

In the following analyses the average number of words per sentence in each child's recall was found by counting the total number of relevant words and the number of sentences used in the recall narrative. The total number of words used was then divided by the total number of sentences to provide a density measure. These were then compared in a Two-Way Analysis of Variance. It was hypothesized that the children's ability rather than the level of social support offered to the child during the listening experience would impact on the number of words (i.e. density) and that further, density is a measure of sentence complexity. We felt that if memory for story was a function of concept and language development then the children should fall into the same ability patterns for the average number of words used per sentence as for the ability to recall text.

Condition by ability analyses were done. As can be seen from Table 3, there are no condition by ability effects. However, there are significant ($p .02$) ability effects. Children who remember the most use significantly more words per sentence than do children of moderate and low memory ability. Although condition effects were not significant, all students, regardless of performance on the memory measure use more words per sentence after guided questioning through the interaction.

Table 3

Mean Number of Words Per Sentence as a Function of Memory Ability and Condition

<u>Memory Ability</u>		<u>Control</u>	<u>Questioning</u>	<u>Co-Construction</u>	<u>Mean</u>
Above Average	Mean	9.69	10.99	9.40	10.02
	S.D.	[4.31]	[3.67]	[1.24]	
Average	Mean	8.54	9.34	9.03	8.97
	S.D.	[1.79]	[2.20]	[2.43]	
Below Average	Mean	6.36	8.43	7.14	7.31
	S.D.	[2.00]	[3.34]	[2.99]	
Mean		8.11	9.53	8.46	

Table 3a**Summary ANOVA for Table 3**

<u>Source</u>	<u>Df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Between Ss	21			
Ability	2	42.42	5.17	< .02
Error (1)	19	8.21		
Within Ss	44			
Condition	2	11.54	1.47	< .24
Condition X Ability	4	1.40	.18	< .94
Error (2)	38	7.85		

Questioning Results

The number of comprehension questions answered appropriately after the children recalled the story was found for each child. Correct answers were then divided into categories based on whether they were answered with text-based information, with picture based information or were answered with an inference generated by the child. Examples of each type of answer can be found in the methods section of this paper.

Comparisons of the three ability groups was not statistically significant for the analysis of number of text based answers. Nor were the comparisons between conditions and the interaction effects between ability and condition. Likewise, the comparisons between ability, conditions, and condition by ability effects were nonsignificant for illustration based answers.

Comparisons of the percentage of inferential answers given and the percentage of incorrect answers however were interesting.

Table 4

**Comprehension Question Answering
Number of Inferential Answers
as a Function of Memory Ability and Condition**

<u>Memory Ability</u>		<u>Control</u>	<u>Questioning</u>	<u>Co-Construction</u>	<u>Mean</u>
Above Average	Mean	1.43	1.71	2.57	1.91
	S.D.	[.54]	[1.38]	[1.27]	
Average	Mean	1.67	1.83	2.00	1.83
	S.D.	[1.03]	[.75]	[1.27]	
Below Average	Mean	.71	.71	1.43	.95
	S.D.	[1.11]	[.76]	[.54]	
Mean		1.25	1.40	2.00	

Table 4a

Summary ANOVA for Table 4

<u>Source</u>	<u>Df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Between Ss	21			
Ability	2	5.79	4.49	.03
Error (1)	19	1.29		
Within Ss	44			
Condition	2	2.96	3.39	.05
Condition X Ability	4	.34	.39	.81
Error (2)	38	.87		

The comparison of the number of inferentially based answers by each of the three groups is significant at the ($p = .03$) level. There are significant condition effects for both number of inferentially based answers and for the number of incorrect answers ($p < .05$) and ($p = .04$) respectively. Specifically, although low memory ability children generate significantly fewer

inferential answers than do the average and above average memory ability children ($p = .03$), children of all ability levels generate more inferential answers in the co-construction condition, fewer in the questioning condition and fewer still in the control condition. Conversely, the students respond with fewer incorrect answers in the co-construction condition followed by the questioning condition. Students make the most mistakes in the control condition. Therefore, social support during the reading of a story-text has a positive effect on both the students ability to answer questions correctly and on the ability to generate appropriate inferences.

Table 5

**Comprehension Question Answering
Number of Incorrect Answers
as a Function of Memory Ability and Condition**

<u>Memory Ability</u>		<u>Control</u>	<u>Questioning</u>	<u>Co-Construction</u>	<u>Mean</u>
Above Average	Mean	1.57	1.57	.86	1.33
	S.D.	[1.13]	[1.27]	[.38]	
Average	Mean	2.50	1.83	1.50	1.94
	S.D.	[.84]	[.75]	[1.05]	
Below Average	Mean	2.75	1.88	1.50	2.04
	S.D.	[2.19]	[.64]	[1.41]	
Mean		2.29	1.76	1.29	

Table 5a

Summary ANOVA for Table 5

<u>Source</u>	<u>Df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Between Ss	21			
Ability	2	3.16	1.78	.20
Error (1)	19	1.77		
Within Ss	44			
Condition	2	5.06	3.75	.03
Condition X Ability	4	.39	.29	.88
Error (2)	38	1.35		

Although the high ability students made fewer mistakes and generated more appropriate inferences overall than did the moderate and low ability students, there are no condition by ability effects given that the same pattern held true for all three ability groups.

Discussion

In this study we modeled three experimental conditions on the story book reading styles identified by Dickinson and Smith (1994) and Dickinson and Keebler (1989) in a long term study of the effects of read aloud on children's vocabulary and comprehension. The study allowed us to explore the relationship between adult-child interactions over a story text and the consequences those interactions have on the assisted performance of children as they negotiate retelling a story and answering comprehension questions about that story.

In order to assess the effects of three types of social interaction on children's comprehension of, and memory for, story text, the children's narrative recall for stories they had either co-constructed freely with an adult, responded to a series of questions about or had heard uninterrupted were analyzed. A summary of the main findings follows.

When individual differences were taken into account by dividing the subjects into above average, average and below average ability groups, it was found that condition by ability interaction effects were significant for total clauses recalled as well as for spontaneously recalled clauses indicating that the effects of condition on recall are influenced by a child's memory ability.

Comparison of the mean total number of prompts required as a function of memory ability and condition was not statistically significant. However, a comparison of the mean number of prompts required as a function of ability and condition showed significant between subject effects. The average and above average groups required less prompting than did the low memory ability group.

Likewise, the average number of words used per sentence differed significantly ($P < .02$) based on ability to recall a story text. Children with above average memory ability used significantly more words per sentence than did children with average and below average memory

abilities. Thus, for every measure tested the below average memory ability students improved with social intervention.

The children's use of text and illustration when answering comprehension questions was not significantly effected by either condition or ability. There were, however, significant ability and condition effects on the children's use of inferences in relation to question answering. Significantly more ($P=.03$) inferences were drawn by above average and average memory ability students than were drawn by low memory ability students. Overall, significantly more ($P = .05$) inferences were drawn in response to comprehension questions in the co-construction condition than were in the questioning or control conditions. Additionally, significantly fewer incorrect responses were given when the children were in the co-construction condition than when they were in either the questioning or the control conditions.

Almost two decades ago Stein (1978) noted that stages of story development can specify the presence or absence of story conventions and structures, but they cannot specify means or mechanisms by which children acquire them. All of the children in this study were read the same stories under the same conditions. Why then did some children seem to learn a great deal and others not much at all.

Katherine Nelson posits two reasons why children's memory for an event may vary.

1. What they notice will vary as a function of their interests, prior knowledge, and what they are doing in the situation.
2. Raw experience is never recallable; it must be interpreted in some way by the conceptual system and how people conceptualize a situation will vary as a function of what they know. (Nelson, 1986)

Co-constructivist theorizing about development involves ascription of the constructive role to the actions of the developing child. However, we do not yet fully understand what kinds of social interactions foster a child's development toward independent functioning or what effects the child has on the quality of the interaction. Some children are very verbal but may only address superficial details. Other children may clearly be struggling to express complex ideas using all of their cognitive and linguistic resources to do so.

Different patterns of social interaction may be effective for different children based on the child's background, both participants understanding of why the story is being read, and what the ultimate goals are. According to Wertsch, Minick and Arns (1984) the Vygotskian school of psychology does not rule out biological growth and individual experience as factors in individual development. Although this point would seem apparent it is most often misunderstood or disregarded according the Wertsch, et al. (1984).

Individual differences and their consequences for cognitive development is an issue that has been open to debate in educational circles. Prawat (1994) has even charged that because teachers consider individual differences so prevalent, they are driven toward a mindless eclecticism in their instructional styles, often employing a wide variety of presentation styles to accommodate what they see as student needs. Could it be that good teachers know something that the research community has not adequately addressed?

Research clearly indicates that prior knowledge affects our ability to learn and remember new material (Carpenter & Just, 1986; Gauntt, 1991; Wilson & Anderson, 1986). Our prior knowledge helps us to direct our attention to important aspects of a text, provides us with a framework for organizing new information and facilitates our efforts to draw inferences, clarify ambiguity or fill in missing detail (Ausubel, Novak, & Hanesian, 1978; Carpenter & Just, 1986; Rumelhart & Ortony, 1977; Wilson & Anderson, 1986). A child's prior knowledge (or lack of it) is apt to have a great deal of influence on his/her ability to learn new material. Thus, the term ability, in this case, refers to a child having the necessary prior knowledge to understand the story text rather than to a theoretical notion of potential (Cronbach & Snow, 1977; Good & Stipek, 1983).

The recall ability of the students we have been referring to as below average students was facilitated by social interaction during story reading because it provided explicit teaching thereby reducing information processing demands on the student. On the other hand, the recall ability of the above average students may have been interfered with by a social intervention which disrupted the child's own previously learned strategies.

Interestingly, all students, regardless of memory ability, were facilitated in comprehension question answering by social intervention and support. All students in this study generated more inferences and gave fewer incorrect responses to questions when in the questioning condition.

Their performance was facilitated even more by the co-construction condition.

An adult collaborator can interact and lend structure to a child's activity in a myriad of different ways. Yet differences in the amount of adult interventions are not generally studied. What is needed now is a study which makes explicit what actually happens when a teacher interacts with individual children who vary in background and ability. By concentrating on what actually happens during an interaction, either as a co-constructed event or a questioning exchange we understand what it means, in terms of teacher-student behavior, for instruction to be conducted through interaction.

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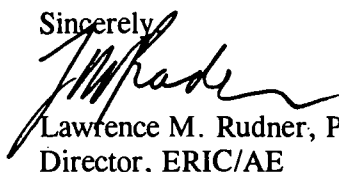
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